The Secretary of Energy
Washington, D.C. 20585

November 30, 2007

The Honorable Richard B. Cheney
President of the Senate
Washington, D.C. 20510

Dear Mr. President:

The Energy Policy Act of 2005 (EPAct), section 1010, requires the Department of Energy to transmit to the Congress a report that examines the feasibility of promoting collaborations between major universities and other colleges and universities in grants, contracts, and cooperative agreements made by the Secretary for energy projects. The enclosed *Report on University Collaboration* is submitted in response to this requirement.

The report concludes that the existing suite of programs and incentives for inclusion of small and minority-serving institutions is quite broad. The Department of Energy's Under Secretary for Science plans to lead a review of the existing suite of programs and determine whether they provide sufficient incentives to promote collaboration and inclusion on research and development projects.

If you should have any questions, please contact me or Ms. Lisa E. Epifani, Assistant Secretary for Congressional and Intergovernmental Affairs, at (202) 586-5450.

Sincerely,

Samuel W. Bodman

Enclosure

The Secretary of Energy
Washington, D.C. 20585

November 30, 2007

The Honorable Nancy Pelosi
Speaker of the House of Representatives
Washington, D.C. 20515

Dear Madam Speaker:

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Samuel W. Bodman

Enclosure

The Secretary of Energy
Washington, D.C. 20585

November 30, 2007

The Honorable Jeff Bingaman
Chairman
Committee on Energy and Natural Resouces
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

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Sincerely,

Samuel W. Bodman

Enclosure

cc: The Honorable Pete V. Domenici
Ranking Member

The Secretary of Energy
Washington, D.C. 20585

November 30, 2007

The Honorable John D. Dingell
Chairman
Committee on Energy and Commerce
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Chairman:

The Energy Policy Act of 2005 (EPAct), section 1010, requires the Department of Energy to transmit to the Congress a report that examines the feasibility of promoting collaborations between major universities and other colleges and universities in grants, contracts, and cooperative agreements made by the Secretary for energy projects. The enclosed *Report on University Collaboration* is submitted in response to this requirement.

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Sincerely,

Samuel W. Bodman

Enclosure

cc: The Honorable Joe Barton
Ranking Member

The Secretary of Energy
Washington, D.C. 20585

November 30, 2007

The Honorable Bart Gordon
Chairman
Committee on Science and Technology
U.S. House of Representatives
Washington, DC 20515

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If you should have any questions, please contact me or Ms. Lisa E. Epifani, Assistant Secretary for Congressional and Intergovernmental Affairs, at (202) 586-5450.

Sincerely,

Samuel W. Bodman

Enclosure

cc: The Honorable Ralph M. Hall
Ranking Member

Report on University Collaboration

EXECUTIVE SUMMARY

The Department of Energy was directed by Congress to examine the "feasibility of promoting collaborations between major universities and other colleges and universities in grants, contracts, and cooperative agreements made by the Secretary for energy projects" as well as to "consider providing incentives to increase the inclusion of small institutions of higher education, including minority-serving institutions, in energy grants, contracts, and cooperative agreements." This report summarizes the findings of this examination, with four main conclusions.

1. Collaborations among colleges and universities do occur and are encouraged in Department energy research and development projects, when appropriate for mission accomplishment.
2. The Department's current practices do not specifically target collaboration among colleges and universities as a rule.
3. The Department tracks minority-serving institutions systematically, but does not currently track collaborations between colleges and universities or track individual performers from underrepresented populations in a systematic manner.
4. The Department's Science and Technology Council will take up the issues of promoting collaboration between colleges and universities as well as incentives to increase inclusion of small and minority-serving institutions in Department energy research and development projects.

INTRODUCTION

The Energy Policy Act of 2005, Pub. L. 109-58, 42 USC 15801, section 1010 states:

> Not later than 2 years after the date of enactment of this Act, the Secretary [of the Department of Energy (DOE)] shall transmit to the Congress a report that examines the feasibility of promoting collaborations between major universities and other colleges and universities in grants, contracts, and cooperative agreements made by the Secretary for energy projects. [M]ajor universities are schools listed by the Carnegie Foundation as Doctoral Research Extensive Universities. The Secretary shall also consider providing incentives to increase the inclusion of small institutions of higher education, including minority-serving institutions, in energy grants, contracts, and cooperative agreements.

This report has been prepared in response to EPAct 2005, section 1010. It focuses on those offices[1] that most directly support the Department's energy mission goal. It briefly describes mechanisms of DOE support for research and development (R&D) programs, ways that colleges and universities, including minority-serving institutions, can and do participate in these R&D programs, and strategies for enhancing inclusion into and collaboration within these programs.

The report is organized around three chapters and includes appendices that contain a list of acronyms and tables of recent funding data. The three chapters are:

I. ***Recent Support for R&D Activities*** identifies current DOE mechanisms for inclusion of colleges and universities in energy projects, as well as recent trends in DOE R&D funding to colleges and universities for energy projects.

II. ***Strategies for Enhancing Collaboration and Inclusion*** describes the DOE approach to enhancing collaboration among colleges and universities for energy projects and providing incentives for inclusion of small and minority-serving institutions on energy projects.

III. ***Conclusions*** summarizes the ways the DOE may proceed in enhancing collaboration and providing incentives for inclusion of colleges and universities in energy projects.

The information for this report reflects DOE experience and practice. The background data presented were gathered from DOE financial records, and were selected to provide a representative sampling of recent funding trends.

I. Recent Support for R&D Activities

College and university participation in energy projects is a priority of the DOE. This is reflected on a departmental level in the DOE Strategic Plan. The offices covered by this report each have mechanisms and programs for inclusion of colleges and universities in energy projects. DOE priorities are also reflected in recent R&D funding patterns.

DOE Strategic Plan

The Department has articulated institutional support for the R&D performed at colleges and universities in the pursuit of mission goals. The Department of Energy 2006 Strategic Plan includes a directive for the Department to provide training opportunities at the Department's

[1] The scope of this report was limited to the Offices of Energy Efficiency and Renewable Energy, Electricity Delivery and Energy Reliability, Fossil Energy, and Nuclear Energy, because of the focus on "energy projects" in EPAct section 1010.

National Laboratories as a way to increase the skills and knowledge of the Nation's scientific and technical workforce,[2] as well as a recognition that the Nation's scientific workforce and science literacy must be grown to prepare citizens to compete for jobs and increase overall economic productivity.[3] The Strategic Plan details the Department's goal to deliver the scientific facilities, train the next generation of scientists and engineers, and provide the laboratory capabilities and infrastructure required for U.S. scientific primacy. This goal is to be accomplished by working with other Federal agencies to recruit the next generation of leaders in science, technology, and engineering and by better communicating the importance of science and technology to inspire participation in the innovation economy.[4] Further, the Department is committed to developing strategic partnerships with other Federal research agencies and the public and private sectors. The combined intellectual capital and science resources are to be leveraged to solve the Nation's challenges in energy, environment, and national security.[5] The Department also plans to implement programs and processes that will enable the Department to quickly recruit, develop, and retain a qualified workforce through an integrated workforce planning system.[6]

Funding Mechanisms and Programs for Supporting Energy R&D at Universities and Colleges

The Department continues efforts to broaden the pool of institutions tapped for energy project participation. Examples of specific R&D programs exist throughout the Department, and include direct partnerships with universities (NE, OE, and FE University Programs) and with university associations (EERE/NASULGC partnership). A broad overview of general DOE funding mechanisms is also given, as well as the Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) mechanism. As a result of these and other activities, the DOE has been selected as a 2007 Top Supporter of Historically Black Colleges and Universities (HBCUs) by the deans of the 11 Accreditation Board for Engineering and Technology (ABET)-accredited HBCU engineering programs, and the corporate-academic alliance Advancing Minorities' Interest in Engineering (AMIE), following a survey by *US Black Engineer and Information Technology (USBE&IT)* magazine.

DOE Direct Programs with Universities

Individual DOE energy R&D offices have direct programs for university participation. Examples of participating offices include the Office of Nuclear Energy, the Office of Electricity Delivery and Energy Reliability, and the Office of Fossil Energy. These programs encourage universities and colleges to participate for a variety of reasons, ranging from ensuring the capacity of a future-trained workforce, to taking advantage of existing outreach and extension infrastructure, to tapping the best available expertise. To help U.S. universities and colleges stay at the forefront of science education and research, the Office of Nuclear Energy (NE) University Program assists universities in the operation of research reactors and in the performance of other educational activities. Direct support is provided to educational

[2] U.S. Department of Energy Strategic Plan, 2006, Strategic Theme 3: Scientific Discovery and Innovation, p. 17.
[3] Id.
[4] Id., p. 18.
[5] Id., p. 19.
[6] Id., p. 24.

institutions in 30 states and territories. These NE programs include: Nuclear Engineering Education Research (NEER) Grants; DOE/Industry Matching Grants; and Nuclear Engineering/Health Physics Fellowships and Scholarships. Further details can be found on the NE website.[7] The Office of Electricity Delivery and Energy Reliability (OE), through an interagency agreement with the National Science Foundation (NSF), supports universities that comprise the Power Systems Engineering Research Center (PSERC).[8] PSERC is a multi-university research consortium that currently includes thirteen universities and some forty company sponsors from the electricity industry. These universities call on multidisciplinary research expertise to address critical electricity industry issues while educating future power engineers. PSERC's comprehensive research program focuses on transmission and distribution technologies, electricity markets, and systems. The Office of Fossil Energy (FE) conducts a university-only competition for coal R&D, the University Turbine Systems Research Program, as well as an HBCU and Other Minority Institutions Education Training Program.

NE: Nuclear Engineering Education Research (NEER) Grants[9]

This highly competitive peer-reviewed program provides grants to nuclear engineering faculty and students for innovative research in nuclear engineering and related areas. The awards run from one to three years and are granted in nine separate technical areas related to nuclear engineering: reactor physics, reactor engineering, reactor materials research, radiological engineering, radioactive waste management, applied radiation science, nuclear safety and risk analysis, innovative technologies, and health physics.

NE: DOE/Industry Matching Grants

The Department of Energy and participating companies provide matching funds, up to $60,000 each, to universities for use in funding scholarships, improving nuclear engineering and science curricula, and modernizing experimental and instructional facilities. Typically 20-25 universities receive funding each year with approximately 35 private sponsors participating.

NE: Nuclear Engineering/Health Physics Fellowships and Scholarships[10]

The Department provides tuition, stipends, and practicums to outstanding graduate students studying nuclear engineering and health physics and undergraduate scholarships and practicums to students pursuing a nuclear engineering course of study. As an element of this activity, the University Partnership Program pairs minority institutions with other institutions offering a nuclear engineering degree to enable more minorities to enter the field of nuclear engineering.

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[7] http://www.ne.doe.gov

[8] http://www.pserc.wisc.edu/

[9] A PART was completed for the University Reactor Infrastructure and Education Assistance program, of which NEER is a part, during the FY 2007 budget formulation cycle. The assessment determined that enrollment target levels of the program have already been met and that students no longer need to be encouraged to enter into nuclear related disciplines. In addition, the number of universities offering nuclear-related programs also has increased. These trends reflect renewed interest in nuclear power. Students will continue to be drawn into this course of study and universities, along with nuclear industry societies and utilities, will continue to invest in university research reactors, students, and faculty members. Consequently, federal assistance is no longer necessary, and the 2008 Budget proposed termination of this program.

[10] The Health Physics Fellowships and Scholarships are also a part of the University Reactor Infrastructure and Education Assistance program. See footnote 9.

OE: Microgrid Partnership
The OE University of Wisconsin Consortium for Electric Reliability Technology Solutions (CERTS) microgrid project is a joint project which involves American Electric Power, Northern Power Systems, TeCogen Inc., Lawrence Berkeley National Laboratory, and Sandia National Laboratories, along with the University of Wisconsin.

The project is based on the CERTS microgrid concept, which consists of clusters of distributed generation and loads that can seamlessly island and reconnect to the grid, and operate in an islanded mode with a minimum of hierarchical control or fast communications. The OE project will examine value-engineering enhancements to selected elements within the original CERTS microgrid test bed to improve the prospects for commercialization.

Some of the business opportunities identified by the project are development of a low-cost Premium Power/Uninterruptible Power Supply (UPS), development of an improved power electronics interface, and increased energy efficiency and reduced emissions. The project will also advance R&D development needs by enhancing the microgrid concept to include energy storage.

FE: University-only Coal R&D Competition
The Office of Fossil Energy set aside funding for a special university-only competition that required professors to conduct cutting-edge research alongside students pursuing degrees in engineering, chemistry, or other technical disciplines. Subsequently, new discoveries in energy science and technology have emerged from the Nation's campuses through the University Coal Research Program while new scientists and engineers with hands-on experience in coal-related research have entered the Nation's workforce.

Since the program's inception, the Department's Office of Fossil Energy has run a competition annually for the best university research proposals in categories that support the government's highest coal research priorities. In its 28 years of existence, the agency has received as many as 200 proposals in a given year from academic institutions across the Nation. Typically between $3 million and $5 million is set aside annually, enough to support 15 to 20 university coal research projects. Private companies also provide funding to help leverage federal dollars in some of these projects.

Since the program's inception in 1979, more than 716 research projects have been funded. With a combined value in excess of $124 million, these projects have provided new insights into coal's future use, and have given more than 1,760 students invaluable experience in understanding the science and technology of coal.

FE: University Turbine Systems Research Program
A cooperative agreement was established in 1992 between the Department and Clemson University to form a university research program for advanced gas turbines. Over the years, the agreement has developed the University Turbine Systems Research (UTSR) Program in which a consortium of university, government, and industry participants work together to maximize the relevance of university research for gas turbine energy systems and to accelerate the

transfer of the research findings to industry, non-participating universities, and to the greater community. The UTSR Program is now focused on development of advanced turbines in 21st century energy plants to operate with high performance and low emissions using syngas and hydrogen fuels.

The UTSR Program is coordinated for the DOE by the South Carolina Institute for Energy Studies (SCIES) at Clemson University. The two major UTSR activities are research and outreach. SCIES identifies needed turbine system research using input from an Industrial Review Board (IRB) and the DOE. University research projects result from a yearly Request for Proposals (RFP) that describes the needed research and is sent to the more than 100 Performing Member Universities of the UTSR. Results from ongoing UTSR research projects are reported in a yearly Peer Review Workshop during which university, government, and industry participants are offered the opportunity to provide input and recommendations to enhance the UTSR program.

UTSR outreach aids in the transfer of university research results and entices growth in the number of industry and university participants in the program. Each year, the UTSR places upper level undergraduate and graduate students from Performing Member Universities into ten to twelve week Fellowship assignments at IRB organizations. Resulting from outreach activities, an Academic Advisory Board (AAB) was established to broaden university participation in the UTSR.

FE: HBCUs and Other Minority Institutions Education and Training

The Office of Fossil Energy also initiated the HBCU Education Training program to expand learning opportunities for university students and increase collaborative efforts between the Nation's minority students and the fossil fuel industry.

Typically, annual competitions are held with about $1 million made available each year for research and training at these institutions. Research proposals can span virtually the entire spectrum of fossil fuel topics, such as advanced ways to use coal cleanly, new methods for recovering and processing oil and natural gas, and innovations in fuel cell technology.

The Department seeks to enhance research methods and capabilities of minority institutions that can help expand diversity for future generations of energy scientists and engineers.

DOE Partnership with University Associations

The Department's Office of Energy Efficiency and Renewable Energy (EERE) has developed a partnership with the National Association of State Universities and Land-Grant Colleges (NASULGC) and the National Center for Food and Agricultural Policy (NCFAP). The focus of the cooperative effort is to provide Extension and Outreach Systems for delivering DOE products and services and to increase the productivity of DOE and NASULGC-affiliated institution research programs.

This partnership has already had a number of accomplishments. For example, one barrier to diverse participation on energy projects is the difficulty Department program managers can face when approaching and selecting academic faculty to participate in energy projects.

Program managers may rely on networks of trusted prior associates. This has the unintended effect of preventing new faculty from entering these networks. To address this challenge, the EERE/NASULGC partnership created a searchable résumé database (Autonomy) containing résumés from faculty, researchers, and extension personnel at NASULGC-affiliated institutions who are willing to serve on peer panels, advisory boards, and participate in other energy projects.

The partnership has also held a workshop at the National Renewable Energy Laboratory (NREL). Participation included 50 universities, including two Native American-serving institutions and 12 HBCUs.

Future plans include expanding the joint university/EERE laboratory workshops to include all EERE program areas, and developing methods to improve the formal exchange between EERE scientists and engineers and university faculty.

Overview of DOE Funding Mechanisms for College and University R&D

The Department of Energy offers many R&D funding mechanisms open to universities and colleges, as well as to collaborations of universities and colleges, including cooperative partnerships, technology transfer, and financial awards. *Cooperative Agreements* are generally cost-shared, with industry, universities and others, to support or stimulate research. *Cooperative Research and Development Agreements (CRADAs)* are legal agreements between DOE laboratories and nonfederal parties in which both participants provide personnel, services, facilities, or equipment for the conduct of specified R&D. The nonfederal parties may also provide funds. *Cost-shared contracts and sub-contracts* are collaborations, through a procurement, of mutual benefit to private industry and to DOE. Under CRADAs and certain other contracts and cooperative agreements, DOE can agree not to disseminate first-produced data for a limited period of time. *Financial Awards* are competitive grants for energy-related research and development, innovations, and inventions. With *Licenses for DOE Patents and Software*, DOE can transfer less than ownership rights in intellectual property, such as a patent or software copyright, to permit its use by the licensee. Under *Personnel Exchange Programs,* DOE or laboratory staff can work in industry facilities, and industry personnel can work in DOE facilities, to enhance technical capacities and support research. *R&D Consortia* are arrangements involving multiple federal and nonfederal parties working together for a common R&D objective. Funding for R&D consortia may be shared. In *Technology Partnerships*, DOE's technology transfer and related technology partnering activities are directed towards facilitating the efficient and expeditious development, transfer, and exploitation of federally developed technology for the public benefit and to enhance the accomplishment of DOE missions. *User Facility Agreements* are arrangements permitting private parties to conduct research and development at a laboratory. *DOE's Work for Others Programs* is the performance of work for non-Department entities by DOE or NNSA personnel and/or their respective contractors for work that is not directly funded by DOE or NNSA appropriations. For proprietary R&D, the laboratory is paid for the full cost. If the work will be published, cost can be adjusted. Intellectual property rights usually belong to the user or sponsor.

Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)

Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) are U.S. Government funding mechanisms in which federal agencies with large R&D budgets set aside a fraction of their funding for competitions among small businesses only. Small businesses that win awards in these programs keep the rights to any technology developed and are encouraged to commercialize the technology. The major difference between SBIR and STTR is that, though both mechanisms are open to small business collaborations with research institutions, STTR projects must involve substantial (at least 30%) cooperative research collaboration between the small business and a non-profit research institution. Since much of the research behind these technologies originates in colleges and universities, those colleges and universities are often involved in the SBIR/STTR programs.

The federal agencies that participate in SBIR and STTR set aside 2.5% and 0.3%, respectively, of their annual extramural R&D budgets. For the DOE in FY 2005, these set-asides corresponded to $102 million and $12 million, respectively. DOE issues an annual solicitation inviting small businesses to apply for SBIR/STTR Phase I grants. It contains technical topics in such research areas as energy production (Fossil, Nuclear, Renewable, and Fusion Energy), Energy Use (in buildings, vehicles, and industry), fundamental energy sciences (materials, life, environmental, and computational sciences, and nuclear and high energy physics), Environmental Management, and Nuclear Nonproliferation. Grant applications submitted by small businesses must respond to a specific topic and subtopic during an open solicitation. SBIR and STTR have three distinct phases. Phase I explores the feasibility of innovative concepts with awards up to $100,000 for about 9 months. Only Phase I award winners may compete for Phase II, the principal R&D effort, with awards up to $750,000 over a two-year period. There is also a Phase III, in which non-Federal capital is used by the small business to pursue commercial applications of the R&D. Also under Phase III, Federal agencies may award non-SBIR/STTR-funded, follow-on grants or contracts for products or processes that meet the mission needs of those agencies, or for further R&D.

Relevant DOE program offices participating in the SBIR/STTR Program include:

Office of Electricity Delivery and Energy Reliability
Office of Energy Efficiency and Renewable Energy
Office of Fossil Energy
Office of Nuclear Energy

Recent R&D Funding Patterns

To put this report into context, an effort was made to aggregate data on the funding pattern toward major universities,[11] MSIs,[12] and small institutions.[13] The current departmental

[11] For consistency with the request, for the purposes of this report, "major universities" are taken to mean those listed with the Carnegie Foundation in 2000 as Doctoral Research-Extensive (DRE) (http://www.carnegiefoundation.org/classifications/index.asp). The Carnegie Foundation has since changed their

tracking mechanism (Procurement and Assistance Data System, or PADS) for individual awards is not designed to track some of the college and university classifications necessary for this report.[14] With these caveats in mind, an approximate analysis has been performed. Some of these data are provided in the tables in Appendices B and C.

As can be seen in the table in Appendix B, typically, the vast majority of funding for DOE energy projects[15] at colleges and universities is directed toward major universities.

Data on collaborations between universities and colleges is not collected in a systematic way across the Department. Hence, no estimate is made as to the current proportions of collaborative projects versus single-institution projects.

II. Strategies for Enhancing Collaboration and Inclusion

The Department is committed to accomplishing mission goals with respect to energy projects. To best achieve these goals, it is critical for the Department to draw upon the best scientific and technological talent available, as well as to support the production of new talent. To this end, the Under Secretary for Science, in coordination with the Office of Economic Impact and Diversity, plans to advise the Secretary on two primary issues for the coming year: demographic and other data collection strategies for energy R&D projects, and inclusion of small and minority-serving institutions in energy projects.

Tracking of Demographic Data of DOE Performers

The DOE Office of Economic Impact and Diversity tracks Department funding going to minority-serving institutions (see Appendix C). But the DOE does not track the demographic data of individual college and university performers. For example, the Office of Science (SC) does not request demographic data from its performers or reviewers. Recently, eight[16] SC Committees of Visitors (COVs) recommended that SC collect diversity statistics for

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classification, and no longer use the DRE label. "Other colleges and universities" are taken to be all non-DRE institutions.

[12] "Minority-serving institutions" (MSIs) are taken to be equivalent to the 2004 list of minority institutions published by the US Department of Education (http://www.ed.gov/about/offices/list/ocr/edlite-minorityinst-list.html).

[13] "Small institutions" are taken to be all non-major institutions.

[14] Indeed, no unique, department-wide identifying code is assigned to institutions in PADS, so the aggregation of funding directed to individual institutions is problematic, regardless of research intensity, size, or minority classification.

[15] "Energy projects" involving colleges and universities were selected from all non-construction work funded by the Offices of Energy Efficiency and Renewable Energy (EERE), Electricity Delivery and Energy Reliability (OE), Fossil Energy (FE), and Nuclear Energy (NE).

[16] Materials Sciences and Engineering Division, March 17-18, 2003; University groups, Major Projects and Laboratory Operations, December 11-12, 2003; Fusion Theory and Computations, March 2004; Climate Change Research Division, March 1-3, 2004; Accelerators, National Laboratories, Universities and Projects, March 8-9, 2004; Applied Mathematics, Computer Science, and Collaboratories, March 9-10, 2004; Chemical Sciences, Geosciences, and Biosciences Division, September 3, 2004; Environmental Remediation Sciences Division, October 5-7, 2004

investigators and/or reviewers to enable the measurement of important information including, for example, numbers of early career investigators/reviewers and numbers of investigators/reviewers from underrepresented populations. SC has determined that it is not in a position under current practices to collect personally identifiable information, even on a voluntary basis, because of privacy considerations. Two good options exist for implementation of such a system; these two methods to collect personally identifiable information are now used by the National Science Foundation (NSF) and the National Institutes of Health (NIH), respectively. Either method would require implementation of new policies and procedures and the commitment of additional resources.

Evaluation of Current Status of Collaboration and Inclusion

The long-term goal of enhancing collaboration between colleges and universities on energy projects, as well as increasing the inclusion of small and minority-serving institutions, is best approached by building competitive R&D capacity in a broader range of institutions. No thorough assessment of the collaboration or inclusion of colleges and universities on energy projects has been performed by the Department. A set of such assessments might consist of a workshop on a department-wide basis, or a series of workshops sponsored by individual R&D program offices. Periodic or systematic corrective measures may provide further opportunities for progress.

To this end, in coordination with the Office of Economic Impact and Diversity, the Science and Technology (S&T) Council plans to undertake a study of the current collaboration activities and inclusion regarding R&D within the DOE. The Under Secretary for Science will lead a review of the relationship of the Department with small institutions and MSIs and will report to the S&T Council as to whether the existing suite of programs provide sufficient incentives to promote collaboration and inclusion on R&D projects.

III. Conclusions

Several conclusions can be drawn from this study of collaboration and inclusion of colleges and universities on energy projects. These include the opportunity for improvements in data collection, promotion of recent efforts, and a study of incentives for inclusion of small and minority institutions on energy projects.

Data Collection

Collaborations among colleges and universities do occur and are encouraged in Department of Energy research and development projects, when appropriate for mission accomplishment. However, there is currently a lack of relevant data collection and aggregation processes. Data on funding toward colleges and universities, though accessible by current methods, do not offer smooth comparisons between – or tracking of – the parameters relevant to this report. Namely, educational institutions are not identified easily by the scale of their respective research

activities, their minority-serving status, or their size. Further, collaborations between institutions are not tracked uniformly and the department's current practices do not specifically target collaboration among colleges and universities as a rule. Such a tracking system, following award-receiving institutions with an updated record of their sizes, minority populations, levels of research activity, and numbers of collaborations and partners, would necessarily be an evolutionary one, since this data stream would change over time. Without collecting and updating this data stream, any measurement of progress in fostering viable R&D in these institutions will continue to be challenging.

Study Incentives

The existing suite of programs and incentives for inclusion of small and minority-serving institutions is quite broad. The Under Secretary for Science plans to lead a review of the existing suite of programs and determine whether they provide sufficient incentives to promote collaboration and inclusion on R&D projects.

APPENDIX A

List of Acronyms

ABET	Accreditation Board for Engineering and Technology
AMIE	Advancing Minorities' Interest in Engineering
ASCR	Advanced Scientific Computing Research (of the Office of Science, DOE)
BER	Biological and Environmental Research (of the Office of Science, DOE)
BES	Basic Energy Sciences (of the Office of Science, DOE)
COV	Committee of Visitors
DOE	Department of Energy
DRE	Doctoral Research-Extensive
EERE	Office of Energy Efficiency and Renewable Energy (of the DOE)
EM	Office of Environmental Management (of the DOE)
EPAct	Energy Policy Act of 2005
EPSCoR	Experimental Program to Stimulate Competitive Research
FaST	Faculty and Student Teams
FE	Office of Fossil Energy (of the DOE)
FY	Fiscal year
FES	Fusion Energy Sciences (of the Office of Science, DOE)
HBCU	Historically Black College or University
MSI	Minority-serving institution
NASULGC	National Association of State Universities and Land-Grant Colleges
NCFAP	National Center for Food and Agriculture Policy
NE	Office of Nuclear Energy (of the DOE)
NIH	National Institutes of Health
NSF	National Science Foundation
NP	Nuclear Physics (of the Office of Science, DOE)
NSF	National Science Foundation
OE	Office of Electricity Delivery and Energy Reliability (of the DOE)
PADS	Procurement and Assistance Data System
PART	Program Assessment Rating Tool
R&D	Research and development
SBIR	Small Business Innovative Research Program
SC	Office of Science (of the DOE)
STTR	Small Business Technology Transfer Program
S&T	science and technology
S-1/S-2/S-3	Secretary, Deputy Secretary, and Under Secretary of Energy, respectively
USBE&IT	*US Black Engineer and Information Technology*

APPENDIX B

DOE Energy Programs, Non-Major University and Minority College and University Funding Pattern[17]

2005

Program	Non-Major[18]	% Non-Major	MSI	% MSI	Total[19]
EE	12,486,000	21.10%	163,000	0.28%	59,181,000
FE	23,752,000	37.46%	1,150,000	1.81%	63,412,000
NE	28,000	0.11%	37,000	0.15%	25,398,000
OE[20]	181,000	1.22%	0	0.00%	14,850,000

2006

Program	Non-Major	% Non-Major	MSI	% MSI	Total
EE	15,155,000	24.48%	148,000	0.24%	61,898,000
FE	19,642,000	31.51%	1,218,000	1.95%	62,330,000
NE	1,568,000	4.83%	34,000	0.10%	32,496,000
OE	0	0.00%	0	0.00%	17,664,000

2007

Program	Non-Major	% Non-Major	MSI	% MSI	Total
EE	8,721,000	20.12%	344,000	0.79%	43,350,000
FE	23,752,000	65.93%	755,000	2.10%	36,025,000
NE	2,195,000	11.54%	0	0.00%	19,015,000
OE	0	0.00%	0	0.00%	6,523,000

[17] The funding cited in Appendix C is the total funding according to PADS from each of the programs to all colleges and universities, except for funding as a part of contracts for administration of national laboratories.
[18] As described in the report, "major" universities are "schools listed by the Carnegie Foundation as Doctoral Research Extensive Universities." See footnote 11 on page 8. "Non-Major" are all colleges and universities that are not "major" universities.
[19] As mentioned in footnote 18, the total numbers are the total amount of funding according to PADS from each of the programs listed to all colleges and universities, except for national laboratory funding.
[20] OE provided data on "funds awarded" during the time period rather than "payments".

APPENDIX C

DOE Minority College and University Funding Pattern

MINORITY EDUCATION FUNDING AS A PERCENT OF
ALL INSTITUTIONS OF HIGHER EDUCATION (IHE)

(DOLLARS IN MILLIONS)

Fiscal Year	Total Funding[21] to Institutions of Higher Education	All Minority-Serving Institutions (% of Total IHE Funding)	Historically Black Colleges and Universities (% of Total IHE Funding)	Hispanic Serving Institutions (% of Total IHE Funding)	Tribal Colleges and Universities (% of Total IHE Funding)
1995	701	72.1 (10.3 %)	59.1 (8.4 %)	10.1 (1.4 %)	2.9 (0.4 %)
1996	728	81.6 (11.2 %)	36.8 (5.1 %)	40.8 (5.6%)	4.0 (0.5 %)
1997	661	78.6 (11.9 %)	31.3 (4.7%)	43.1 (6.5%)	4.2 (0.6 %)
1998	627	63.7 (10.2 %)	23.7 (3.8 %)	32.0 (5.1 %)	8.0 (1.3 %)
1999	714	61.7 (8.6 %)	20.2 (2.8 %)	39.0 (5.5 %)	2.5 (0.3 %)
2000	620	46.3 (7.5 %)	17.1 (2.8 %)	27.7 (4.5 %)	1.5 (0.2 %)
2001	831	43.1 (5.2 %)	13.5 (1.6 %)	28.4 (3.4 %)	1.2 (0.1 %)
2002	733	43.4 (5.9 %)	12.7 (1.7 %)	30.4 (4.1 %)	0.3 (0.04 %)
2003	861	54.1 (6.3 %)	13.1 (1.5 %)	40.1 (4.7 %)	0.8 (0.09 %)
2004	773	33.7 (4.4 %)	10.8 (1.4 %)	22.0 (2.8 %)	0.9 (0.12 %)
2005	873	55.7 (6.4%)	35.4 (4.0 %)	20.2 (2.3 %)	0.1 (0.01 %)
2006	821	39.1 (2.8 %)	20.9 (2.5 %)	18.0 (2.2 %)	0.2 (0.02 %)

[21] Total funding includes funding from all DOE offices including NNSA. Data collected by the Office of Economic Impact and Diversity.